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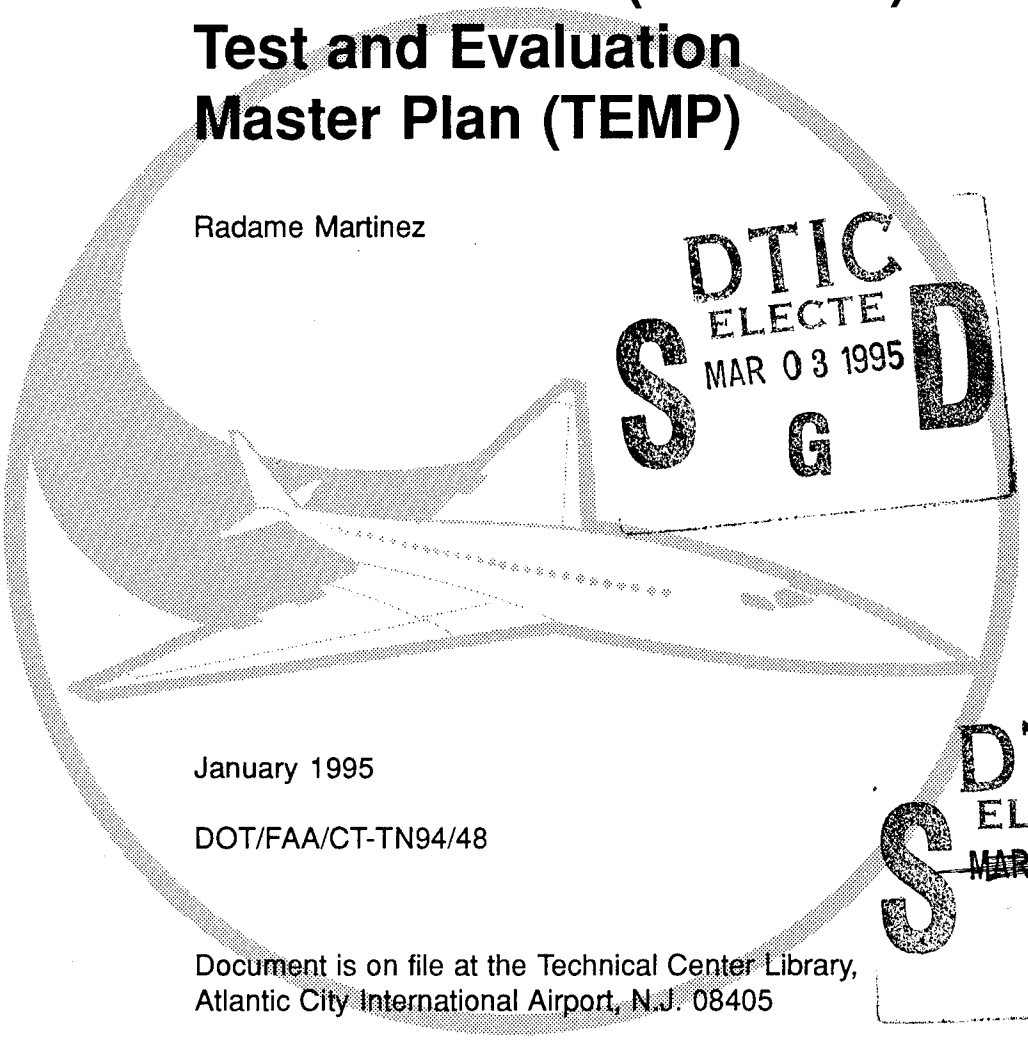
Offshore Next Generation Weather Radar (NEXRAD) Test and Evaluation Master Plan (TEMP)

Radame Martinez



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16. Abstract

This document provides the test philosophy and approach for the Offshore Next Generation Weather Radar (NEXRAD) Test and Evaluation Master Plan (TEMP).

The NEXRAD differs from the typical Federal Aviation Administration (FAA) weather radar acquisition in that it is jointly funded by the Department of Defense (DOD), the Department of Commerce (DOC), and the Department of Transportation (DOT). These three agencies chartered the Joint System Program Office (JSPO) to manage the NEXRAD development and subsequent test programs. JSPO has deployed 70 single-channel radar systems across the continental United States (CONUS).

The FAA is deploying NEXRAD systems at non-CONUS (offshore) locations such as Alaska, Hawaii, and the Caribbean. The FAA Offshore NEXRAD will have a redundant configuration and a Remote Monitoring Subsystem (RMS).

A total of 14 Offshore NEXRADs will be procured under this acquisition: 3 in the Caribbean, 4 in Hawaii, and 7 in Alaska. Funding constraints will limit the acquisition to seven NEXRADs in the 1994-1995 timeframe.

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EXECUTIVE SUMMARY

This document provides the test philosophy and approach for the Offshore Next Generation Weather Radar (NEXRAD) Test and Evaluation Master Plan (TEMP).

The NEXRAD differs from the typical Federal Aviation Administration (FAA) weather radar acquisition in that it is jointly funded by the Department of Defense (DOD), the Department of Commerce (DOC) and the Department of Transportation (DOT). These three agencies chartered the Joint System Program Office (JSPO) to manage the NEXRAD development and subsequent test programs. JSPO has deployed 70 single-channel radar systems across the continental United States (CONUS).

The FAA is deploying NEXRAD systems at non-CONUS (offshore) locations such as Alaska, Hawaii, and the Caribbean. The FAA Offshore NEXRAD will have a redundant configuration and a Remote Monitoring Subsystem (RMS).

Initially, a NEXRAD TEMP addressing all National Airspace System (NAS) specifications went through the clearance process and all comments were resolved. However, upon further assessment of costs and previous testing, the NEXRAD Program Management Office (PMO) decided to have the NEXRAD TEMP rewritten to primarily focus on the FAA enhancements to the NEXRAD system. This revised TEMP concentrates on testing the NEXRAD enhancements and not retesting features of the operational single-channel NEXRAD system. Testing described in this document will not address the NEXRAD Principal User Processor (PUP) since it has successfully completed a full operational evaluation.

A total of 14 Offshore NEXRADs will be procured under this acquisition: 3 in the Caribbean, 4 in Hawaii, and 7 in Alaska. Funding constraints will limit the acquisition to seven NEXRADs in the 1994-1995 timeframe.

1. INTRODUCTION.

The Next Generation Weather Radar (NEXRAD) program establishes a weather radar network which will provide accurate and suitable aviation weather products. The Joint System Program Office (JSPO) completed Operational Test and Evaluation (OT&E) of the single-channel NEXRAD in 1989, although Developmental Test and Evaluation (DT&E) continued through 1990. The single-channel NEXRAD system is currently being deployed in the continental United States (CONUS) for use by the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). The FAA will procure through JSPO, off-the-shelf NEXRADs in a redundant configuration and the FAA will then add the Remote Monitoring Subsystem (RMS) capability at a later date. These FAA redundant configuration NEXRADs will be deployed to non-CONUS locations and hence are referred to as Offshore NEXRADs. A total of 14 Offshore NEXRADs will be procured under this acquisition: 3 in the Caribbean, 4 in Hawaii, and 7 in Alaska. First site testing will be performed in Kauai, Hawaii. This document addresses the testing of the two FAA enhancements to the initial system: redundancy and RMS.

1.1 SCOPE.

This Test and Evaluation Master Plan (TEMP) describes test requirements, general methodology and responsibilities for DT&E, OT&E, and Production Acceptance Test and Evaluation (PAT&E) testing. The testing is limited in nature due to the extensive testing already performed on the single channel NEXRAD by JSPO and funding shortfalls. The scope of testing will primarily address the FAA enhancements. This testing will consist of two phases: redundant configuration and RMS testing.

1.2 BACKGROUND.

The NEXRAD system, developed by the Unisys Corporation, is an "S" band doppler weather radar capable of detecting the location, severity, and movement of both routine and hazardous weather phenomena. Since 1991, Unisys Corporation has been the prime contractor on the project. The JSPO, through the Air Force Operational Test and Evaluation Center (AFOTEC), completed operational testing of the NEXRAD in 1989, although DT&E continued through 1990. The JSPO NEXRAD systems are currently being deployed for use by the NWS, FAA, and DOD.

The single-channel NEXRAD systems lack a redundant configuration and have no RMS capabilities. To satisfy National Airspace System (NAS) requirements, the FAA will procure through JSPO, Offshore NEXRADs which are off-the-shelf JSPO NEXRADs in a redundant configuration and add RMS capabilities under a separate procurement effort. These Offshore NEXRADs will be procured, installed, and maintained by the FAA for locations in the

Caribbean, Alaska, and Hawaii, to enhance existing equipment availability.

Unisys is the prime contractor for the redundant configuration, while the RMS will be procured by the National Engineering and Field Support Division, AOS-200, in conjunction with the Program Office.

2. REFERENCE DOCUMENTS.

2.1 FAA DOCUMENTS.

2.1.1 FAA Specifications.

NAS-SS-1000	NAS System Specification, Volume I, Functional and Performance Requirements for the National Airspace System General, October 1992.
NAS-SS-1000	NAS System Specification, Volume III, Functional and Performance Requirements for the Ground-to-Air Element, February 1993.
NAS-SS-1000	NAS System Specification, Volume V, Functional and Performance Requirements for the National Airspace System Maintenance and Operations Support Element, October 1992.

2.1.2 FAA Standards.

FAA-STD-024B	Preparation of Test and Evaluation Plans and Test Procedures, August 22, 1994.
CT 1710.2B	Preparation and Issuance of Formal Reports, Technical Notes and other Documentation, February 13, 1990.

2.1.3 Other FAA Publications.

NAS-MD-790	Remote Maintenance Monitoring System Interface Control Document (ICD), Maintenance Processor Subsystem (MPS) to Remote Monitoring Subsystems (RMS) and Remote Monitoring Subsystem Concentrators (RMSC), June 10, 1986.
NAS-MD-793	Remote Maintenance Monitoring System Functional Requirements for the Remote Monitoring Subsystem (RMS), February 28, 1986.
FAA ORDER 1810.1F	FAA Acquisition Process, March 19, 1993.

FAA ORDER 1810.4B	FAA NAS Test and Evaluation Policy, October 22, 1992.

2.2 OTHER DOCUMENTS.

JSPO R400-TP301	NEXRAD TEMP, May 31, 1990.
R400-SP401A	NEXRAD Technical Requirements (NTR), 1 November 1991.
AFOTEC PROJECT 86-0167	NEXRAD Initial Operational Test and Evaluation (IOT&E), Phase II Final Report, December 1989.
CDRL 505	CI Level Test Procedures for Redundancy, May 20, 1993.
1310035A	Build 7 Test Plan, October 15, 1993.
CDRL 245	Build 7 Test Procedures, November 1, 1993.
DV1208251F	Critical Item Development Specification for Tower Utilities (B4, CI-01).
DV1208252G	Critical Item Development Specification for Antenna Pedestal (B2, CI-02).
DV1208253F	Critical Item Development Specification for Transmitter (B2, CI-03).
DV1208254E	Critical Item Development Specification for Receiver/Signal Processor (B2, CI-04).
DV1208255F	Critical Item Development Specification for Radar Data Acquisition (RDA) Control (B2, CI-05).
DV1208256E	Critical Item Development Specification for Wideband Communications Link (B2, CI-06).
DV1208257F	Critical Item Development Specification for Radar Product Generation (RPG) Equipment (B1, CI-07).
DV1208258F	Critical Item Development Specification for Principle Users Processor/RPG Operational Position (PUP/RPGOP) Equipment (B1, CI-08).
DV1208250E	Critical Item Development Specification for RDA Equipment (B1, CI-09).
CDRL 246	Production Acceptance Tests For CLIN 0001AD Bloomfield, CT.

3. DESCRIPTION.

3.1 MISSION.

The NEXRAD mission is to provide improved aviation safety and more efficient use of airspace through the detection and warning of hazardous weather in the enroute and oceanic environments. The FAA will maintain Offshore NEXRADs in areas where neither the Department of Commerce (DOC) nor the DOD provide coverage, such as Alaska, Hawaii, and the Caribbean. The NWS will operate these units to provide weather information to air traffic control (ATC) facilities, the aviation community, and other principal users.

These Offshore NEXRADs must fully meet users' requirements for timely, reliable, and operationally acceptable hazardous weather and planning information. The system must be supportable, cost effective, growth adaptable, and be acquired in accordance with applicable standards, regulations, and policies.

The Offshore NEXRAD will have two FAA enhancements; a redundant channel and an RMS. The redundant configuration increases system availability. Either radar channel has complete NEXRAD weather detection capabilities. The RMS will provide information to the RMMS.

3.2 OFFSHORE NEXRAD SYSTEM.

The Offshore NEXRAD system will consist of 14 radar systems (3 in the Caribbean, 4 in Hawaii, and 7 in Alaska) with associated communications, data processing hardware and software, display and data equipment, documentation, and support facilities.

3.2.1 Key Functions.

The Offshore NEXRADs will acquire, process, distribute, and display weather radar information to support the FAA's needs. The information includes location, severity, and movement of both routine and hazardous weather phenomena. Primary functional areas consist of RDA, RPG, PUP, Communications, Facilities, and Support.

3.2.2 Interfaces.

Initially, the FAA Air Route Traffic Control Centers (ARTCC) will have access to NEXRAD products through the PUP which will be installed at the ARTCC. In the end-state, the Offshore NEXRAD will disseminate weather products to the ARTCCs via the Weather Acquisition and Radar Processor (WARP) routinely, and upon request.

The Offshore NEXRAD radar will provide weather products to the National Oceanic and Atmospheric Administration (NOAA), DOD, and

other users as required. The NEXRAD also will transmit maintenance data to the MPS.

Figure 3.2.2-1 shows a simplified block diagram of the NEXRAD interfaces. The WARP and RMS are not yet available for testing. Note that for Offshore NEXRAD systems, the ARTCC equivalent is the Center Radar Approach Control (CERAP) and does not have a Central Weather Service Unit (CWSU) composed of trained meteorologists to interpret weather data.

3.2.3 Unique Characteristics.

The NEXRAD has the capability to accurately measure weather reflectivity and velocity, which is necessary for detecting and forecasting hazardous aviation weather events.

3.3 REQUIRED OPERATIONAL CHARACTERISTICS.

The following are required operational characteristics for the Offshore NEXRAD in the context of this TEMP:

a. Possess an overall system Mean Time Between Failures (MTBF) of 4037 hours and an availability of 0.99987616;

b. Possess the capability to monitor and provide maintenance status to the Maintenance Data Terminal (MDT) and the MPS in accordance with NAS-SS-1000, volume V requirements;

c. Possess the capability to predict aviation related hazardous conditions. These phenomena, which are not mutually exclusive, include the following: precipitation, wind and wind shear, tornadoes, fronts/fine lines, hurricanes, tropical cyclones, mesocyclones, thunderstorms, turbulence, hail and freezing/melting level;

d. Possess an RMS MTBF of 11900 hours and an availability of 0.99995799.

Reliability and availability figures are per NAS-SS-1000, volume I.

3.4 REQUIRED TECHNICAL CHARACTERISTICS.

Detailed technical characteristics are defined in section 3 of the NTR. The redundant configuration specifications are defined in section 3.2.1.5.1 of the NTR and have been modified by Contract Modification 0078 and 0123 for NWS/FAA Redundant Configurations. The NEXRAD, in the context of this TEMP, shall have the following:

a. An RMS capable of supporting NAS-SS-1000, volume V requirements;

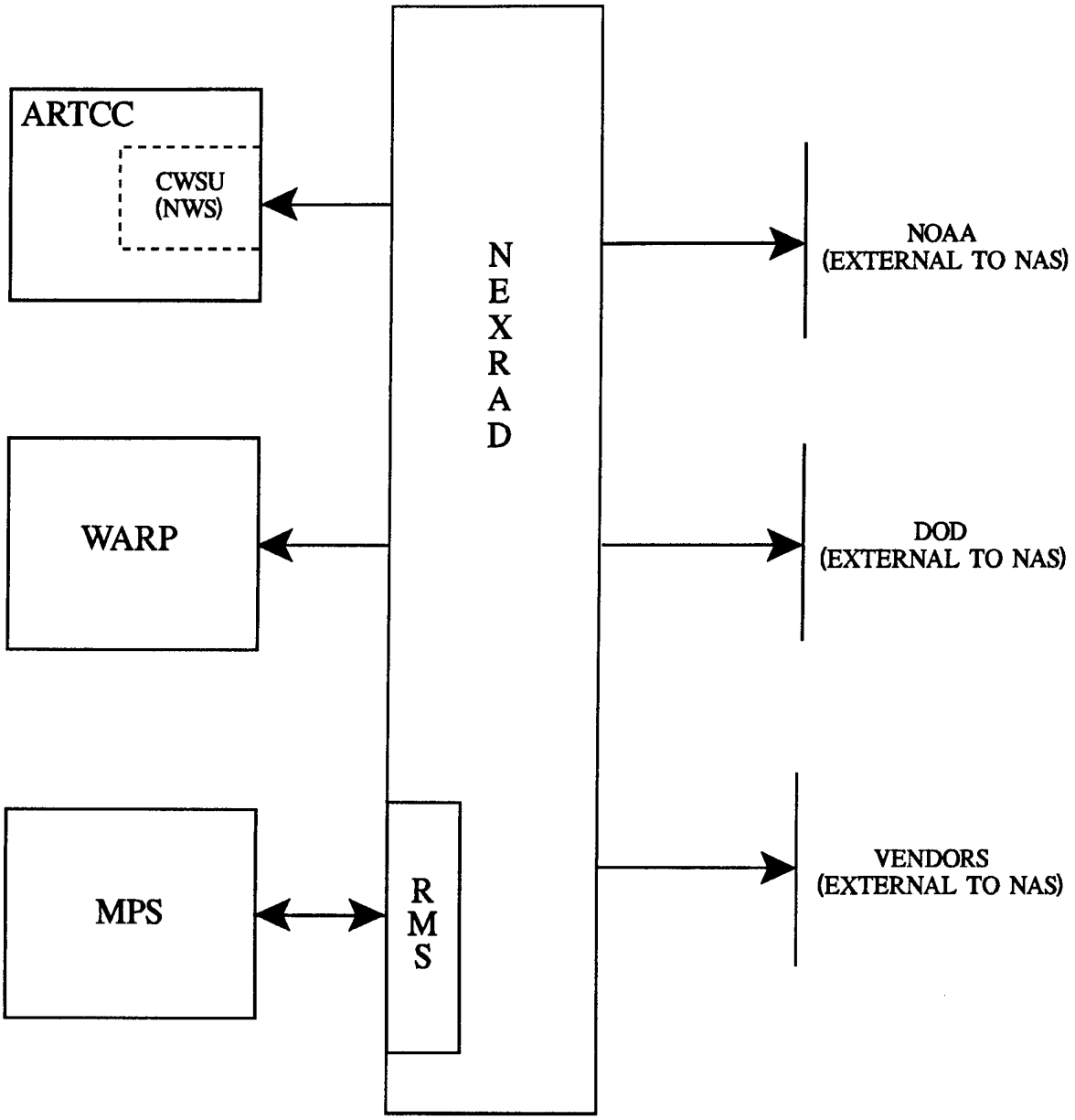

FIGURE 3.2.2-1. NEXRAD INTERFACE BLOCK DIAGRAM

b. Redundant hardware which will enable the NEXRAD to achieve the operational requirements for reliability and availability. RDA, RPG functional area equipment, wideband and narrowband communications will be redundant. The antenna, pedestal, tower, and backup power generator will not be redundant;

c. Processing software capable of supporting a redundant system while meeting existing operational requirements identified in the Verification Requirements Test Matrix (VRTM) (appendix A).

3.5 CRITICAL OPERATIONAL ISSUES (COI).

3.5.1 Critical DT&E Issues.

No critical DT&E issues were identified during the redundant configuration development testing at the contractor facility. RMS development has not started.

3.5.2 Critical OT&E Issues.

The following are critical OT&E issues of the Offshore NEXRADs:

a. Inadequate test time to fully evaluate required system availability;

b. Due to the proximity of testing, scheduling and coordination will be critical to the successful testing of this system.

3.6 TEST STRATEGY.

The testing strategy for the Offshore NEXRAD will be performed in two phases: Phase 1, redundant configuration testing, will take place in 1994, at two locations: the factory in Great Neck, New York and Kauai, Hawaii; and Phase 2, RMS testing, will take place in 1998, at a site to be determined (TBD). The test strategy will be responsible for:

a. Ensuring the redundant NEXRAD provides comparable performance upon reconfiguration. Response times must meet existing NAS time constraints;

b. Ensuring that the system can be easily and rapidly restored to operational status following a failure in the redundant configuration;

c. Ensuring the RMS provides accurate and timely information to the MPS.

Testing to ensure redundancy and RMS requirements are met will be accomplished through DT&E including Site Acceptance Testing

(SAT), OT&E Integration, OT&E Operational, OT&E Shakedown, PAT&E, and Field Shakedown.

3.7 MINIMUM OPERATIONAL PERFORMANCE.

The minimum operational performance criteria for the Offshore NEXRAD can be divided into two categories; technical and functional. Minimum technical performance criteria is defined quantitatively in the VRTM and defines physical operating performance required from the Offshore NEXRAD system. This type of data is typically associated with minimum and/or maximum performance parameters. Minimum functional performance criteria is defined qualitatively in FAA Order 1810.4B and NAS-SS-1000 and is a measure of the effectiveness of the system at performing the required tasks. OT&E testing will address both categories of minimum operational performance and identify any deficiencies in either category.

4. PROGRAM SUMMARY.

4.1 MANAGEMENT.

The following paragraphs describe the management process and the participating organizations' roles and responsibilities.

4.1.1 Weather Radar Program Office.

The Weather Radar Program Office, ANR-500, is responsible for the overall management of the Offshore NEXRAD program, from the acquisition and implementation through the Operational Readiness Demonstration (ORD).

The Program Office is supported by the following Associate Program Managers (APM):

a. APM for Engineering (APME),
b. APM for Logistics (APML),
c. APM for Maintenance (APMM),
d. APM for Requirements (APMR),
e. APM for System Engineering (APMSE),
f. APM for Test (APMT).

4.1.2 Test Policy Review Committee (TPRC).

The Chairperson of the TPRC will support Test and Evaluation (T&E) policy, test standards, and definitions. The TPRC is responsible for approving the TEMP and revisions to the TEMP, as well as approving test policy waivers and resolving disagreements on T&E issues when agreements cannot be reached at lower levels of FAA Management.

4.1.3 APMT.

The APMT is from the Weather/Primary Radar Division, ACW-200, organization located at the FAA Technical Center. It is the responsibility of the Program Manager (PM) and APMT to develop a TPRC approved Offshore NEXRAD TEMP.

The APMT has the responsibilities as detailed in FAA Order 1810.4B. The APMT will be responsible for conducting overall OT&E activities, specifically OT&E Operational and OT&E Integration, which are subsets of OT&E testing. ACW-200D will prepare test plans, test procedures, and test reports for ANR-500.

The APMT has established a Test Planning Working Group (TPWG) to coordinate testing and address test issues. The APMT will also be responsible for tracking and ensuring the resolution of program trouble reports resulting from these test efforts.

4.1.4 Operational Support Services - Radar Engineering Support Branch.

The Radar Engineering Support Branch, AOS-230, will conduct OT&E Shakedown at the redundant configuration site in Kauai, Hawaii. AOS-230 will also have responsibility for RMS Shakedown.

4.1.5 Regional Responsibility.

Field Shakedown testing will be conducted by the corresponding regions; Southern, Alaska, and Western Pacific (e.g., Western Pacific Region (AWP) will conduct Field Shakedown testing on all sites within their region).

4.1.6 Unisys Corporation Responsibility.

The contractor will be responsible for the planning, conduct, and analysis of all contractually required testing in accordance with the Statement of Work (SOW) and the Contract.

4.1.7 National Engineering and Field Support Division Responsibility.

The National Engineering and Field Support Division, AOS-200, will coordinate the RMS procurement for the Offshore NEXRAD Program. AOS-200 will plan and conduct testing in accordance with FAA Order 1810.4B.

4.2 OFFSHORE NEXRAD INTEGRATED SCHEDULE.

The schedule presented in appendix B depicts the NEXRAD Integrated Test Schedule. It is anticipated that the redundant configuration installation will be completed prior to completion

of any RMS test events. The schedule will be updated as changes occur. Fiscal year 1997 is the earliest expected date for the RMS.

4.3 TEST PLANS.

ACW-200D will develop the OT&E Integration and OT&E Operational Test Plan and Procedures in accordance with FAA Order 1810.4B and FAA-STD-024B.

The ATC Sustaining Engineering Branch, ACN-100D, will develop RMS OT&E Integration and OT&E Operational test plans, procedures, and test reports.

AOS-230 will develop the OT&E Shakedown Test Plan and Procedures in accordance with FAA Order 1810.4B. These plan and procedures will ensure shakedown is conducted per FAA Order 1810.4B direction. Table 4.3-1 identifies test documents and their responsible organizations. Appendix B identifies expected delivery dates for these documents.

4.4 TEST PROCEDURES.

Test procedures will be provided for all of the test plans described above. The test procedures will be identified in the appropriate test plans. Test procedures will provide step-by-step instructions for preparation, execution, termination, and documentation of tests.

4.5 TEST REPORTS.

The test reports will document the results of formal testing. Test reports will evaluate the system's compliance with the NTR, NAS-SS-1000, and operational requirements. Contractor test reports will be submitted in accordance with the contract. Government test reports are the responsibility of the APMT and AOS-200, and will be written in accordance with 1810.4B and FAA-STD-024B.

TABLE 4.3-1. TEST DOCUMENTS

DOCUMENT TITLE	RESPONSIBLE ORGANIZATION
Offshore NEXRAD TEMP	APMT - ACW-200D
DT&E Plan - Redundant Configuration	Unisys
DT&E Plan - RMS	TBD
OT&E Integration and OT&E Operational Plan - Redundant Configuration	APMT - ACW-200D
OT&E Integration Plan - RMS	APMT - ACN-100
OT&E Operational Plan - RMS	APMT - ACN-100
OT&E Shakedown Redundancy Test Plan	AOS-230

5. DT&E AND PAT&E SCOPE, EVENTS, SCENARIOS.

DT&E will ensure that the redundancy and RMS designs are in accordance with product specifications. The redundancy DT&E will be conducted at Unisys. The organization responsible for DT&E testing of the RMS is TBD. PAT&E will be conducted by Unisys for the redundant configuration without the RMS enhancement. PAT&E will be conducted by the responsible developers prior to Field Shakedown. The RMS developers are TBD and will be procured under a separate competitive contract.

5.1 DT&E/PAT&E TO DATE.

The JSPO NEXRAD has been extensively tested by AFOTEC. DT&E of the redundant channel configuration has been performed by Unisys. A Factory System Test was successfully performed by Unisys on the redundant configuration. No PAT&E to date has been performed on a redundant configuration. Formal test reports have not been completed. No RMS DT&E has been performed to date.

5.2 FUTURE DT&E/PAT&E.

Unisys will perform the redundant configuration PAT&E. AOS-200 will procure the RMS portion of the system in conjunction with the Program Office, and will test the RMS relative to shakedown requirements. The schedule for RMS testing is included in appendix B.

5.3 CRITICAL DT&E/PAT&E ITEMS.

Unisys has completed hardware and software DT&E of the redundant configuration. ACW-200 monitored testing and observed no COIs.

6. OT&E INTEGRATION, OT&E OPERATIONAL, AND OT&E SHAKEDOWN.

The FAA will conduct OT&E Integration, OT&E Operational, and OT&E Shakedown testing on the redundant system. OT&E Operational and OT&E Shakedown testing of the RMS will begin after the Interim Monitor and Control Software (IMCS) module has passed Confidence Testing.

Any deficiencies identified during OT&E testing will be logged as program trouble reports. The program trouble report is the vehicle for resolving the deficiency. The APMT will provide all program trouble reports to the Program Office and recommendations for resolving the deficiency.

6.1 OT&E TO DATE.

No OT&E to date has been performed on the redundant configuration enhancement or the RMS enhancement.

Full Phase A OT&E was performed on the contractor's single channel prototype system in 1986. OT&E Phase B was conducted on the contractor's prototype system in 1987. An integrated, tri-agency (DOC, DOD, DOT) test team, under the overall management of AFOTEC, conducted the Initial OT&E Phase II of the NEXRAD between March and August of 1989, at three sites: Norman, Oklahoma; Tinker Air Force Base; and Oklahoma City, Oklahoma.

OT&E Shakedown was performed on the PUP by AOS-230 at the Washington ARTCC in Leesburg, Virginia, during September 1992. OT&E Operational testing was performed on the PUP at the Washington ARTCC during the week of March 22, 1993, by ACW-200D, and at the Houston ARTCC (Houston, Texas) during the week of March 29, 1993.

6.2 OT&E INTEGRATION TEST SCOPE, EVENTS, SCENARIOS.

The OT&E Integration test objective is to assess the Offshore NEXRAD's capability to interface with other NAS systems such as the MPS. Redundant configuration OT&E Integration will be accomplished in Kauai, Hawaii. No site has yet been identified for RMS OT&E Integration testing. Except for the RMS to MPS and WARP interfaces, Offshore NEXRAD weather radar sites are essentially stand-alone. OT&E integration test objectives are:

a. Verify the redundant configuration interface operates in accordance with NAS requirements;

b. Verify that the RMS properly interfaces with the MPS.

ACW-200D will draft an integration and operational test plan to ensure the redundant features of NEXRAD comply with the VRTM requirements presented in this plan. ACN-100D will develop an

integration test plan and test procedures to ensure that the RMS interfaces with the MPS in accordance with the NAS requirements presented in this plan.

6.3 OT&E OPERATIONAL TEST SCOPE, EVENTS, SCENARIOS.

Although AFOTEC conducted an extensive operational evaluation on the JSPO NEXRAD, some OT&E Operational requirements will be evaluated in accordance with FAA Order 1810.4B. The purpose is to ensure that the operational requirements have not been degraded due to the enhancements. The test scope will consist of testing the following for compliance with applicable VRTM and FAA Orders:

a. Reliability,
b. Degraded Operations,
c. Maintainability,
d. Availability,
e. Security,
f. Safety,
g. Adaptation Data.

Test scenarios will be identified in the OT&E Integration and OT&E Operational plan.

6.4 OT&E SHAKEDOWN SCOPE, EVENTS, SCENARIOS.

OT&E Shakedown will be conducted at the first operational site. Selected areas of concern found during OT&E Integration may be retested in the actual operational environment. The scope of testing will evaluate field suitability and effectiveness of the following:

a. RMS and redundant configuration,
b. Training,
c. Documentation.

Air conditioning, power distribution, cable routing, utility ground bus, and communication line discrepancies will be identified. Logistics support issues also will be addressed.

6.5 CRITICAL OT&E ISSUES.

A critical area previously identified from JSPO NEXRAD test program was the system's reliability and availability performance. Reliability and maintainability data will be collected and analyzed during both the RMS and redundant configuration testing.

7. SPECIAL RESOURCE SUMMARY.

7.1 TEST ARTICLES.

A total of 14 Offshore NEXRADs will be procured under this acquisition: 3 in the Caribbean, 4 in Hawaii, and 7 in Alaska. All of these sites will require PAT&E and Field Shakedown. First site testing will be performed in Kauai, Hawaii, on the redundant configuration. The redundant configuration will be tested in 1994. Testing of the RMMS-configured Offshore NEXRAD will be determined by funding availability, no earlier than fiscal year 1997.

7.2 SPECIAL SUPPORT REQUIREMENTS.

Radar technicians and engineers trained in the operation and maintenance of NEXRAD will be required to support OT&E Integration and OT&E Shakedown. Easy access to spare parts will be required in order to minimize potential downtime resulting from equipment failures during testing. Expertise in doppler weather meteorology also will be required to perform OT&E Integration and OT&E Operational testing. IMCS confidence testing will require the skills of trained radar technicians. Test equipment normally required to support site operation will be required.

7.3 PERSONNEL REQUIREMENTS.

The following is a list of personnel requirements:

a. ACW-200D will require test engineers to draft plans and procedures, conduct testing, and draft reports;

b. AOS-200 will require test personnel to accomplish program monitoring and accommodate test activities;

c. Regional manpower will be required for system and maintenance support (two maintenance technicians and one operator at the Unit Control Position (UCP)). A meteorologist for the PUP will be required and located at the CERAP and/or NWS in Honolulu;

d. FAA Technical Center will need to provide personnel for the duration of OT&E Integration and OT&E Operational testing,

e. Meteorological support will be requested from the NWS for weather support for the duration of the test,

f. ACN-100D will require RMS test plan, test procedure writers, and engineers to conduct RMS testing.

7.4 SPECIAL SUPPORT REQUIREMENTS.

7.4.1 MPS Simulator.

Synchronous Enhanced MPS Communications Simulator and LM1 Protocol Analyzer (version 8.0) will be required for testing link level communications.

7.4.2 Software.

RMS--MPS testing will require updated IMCS, RMS Terminal Software, and Procomm software for the MDT. Database software, such as DBIV, should be procured and used for analysis of the failure data.

7.5 TRAINING REQUIREMENTS.

Currently, DOD, NWS, and FAA personnel are trained in the operation of single-channel NEXRAD systems at the Keesler Air Force Base, Mississippi. The training manuals which explain operation and maintenance of the redundant configuration are not formalized and currently not available. Operators and technicians, therefore, will be inexperienced in the operation and maintenance of an FAA redundant configuration.

Training prior to the test will be required. Training of FAA Technical Center government and contractor support test personnel will encompass various instructional and self-learning processes in preparation for the OT&E Operational testing of the Offshore NEXRAD.

Reading of technically related NEXRAD literature will be the basic and chief medium of gaining familiarization with the system. The various forms of informational reading will include: NAS publications related to NEXRAD, single-channel NEXRAD operation and maintenance instructions, NEXRAD Technical Requirements (NTR), JSPO NEXRAD Test Plans and Reports, FAA Headquarters' generated documents and other FAA orders.

The Meteorologist required from the NWS must be familiar with interpreting NEXRAD weather data. This will require the interpretation of two sets of NEXRAD base products from sites that are not collocated.

7.6 FUNDING REQUIREMENTS.

Table 7.6-1 is a cost estimate for the testing at the first site in Kauai, Hawaii. The estimate is based on several assumptions including a 1-month test time for ACW and 1-month test time for AOS. Also, the estimate assumes no major failures during testing which would cause excessive downtime. Other assumptions include a 4-percent yearly increase in cost, the Alaskan Region (AAL) and

Southern Region (ASO) funding to participate in testing, and NWS support for testing is provided without charge. The Kauai Sector Field Office (SFO) has estimated their requirements as indicated. Operational Support Facility (OSF) support may be required, however, at this time no OSF on-site support for OT&E Integration and OT&E Operational testing is scheduled.

TABLE 7.6-1. COST ESTIMATE FOR OFFSHORE NEXRAD OT&E TESTING FY (K$)

OT&E INT./OP.	94	95	96
APMT	22.50	23.40	24.34
CONTRACTOR SUPPORT	240.00	249.60	259.58
KAUAI SFO	10.00	-	-
OSF*	-	-	-
ASO	15.00	-	-
AAL	20.00	-	-

OT&E SHAKEDOWN	94	95	96
AOS	45.00	46.80	48.67
CONTRACTOR SUPPORT	240.00	249.60	259.58
KAUAI SFO	10.00	-	-
ASO	-	-	-
OSF	15.00	-	-
AAL	-	-	-

TOTALS	617.50	569.40	592.17
3 YEAR TOTAL	1779.07		

* ACW will require the OSF only for secondary support or in case of a major system failure.

8. ACRONYMS AND ABBREVIATIONS.

A	Analysis
AAL	FAA, Alaskan Region
ACN	Engineering, Test and Evaluation Service
ACW	Engineering, Integration, and Operational Evaluation Service
AFOTEC	Air Force Operational Test and Evaluation Center
APM	Associate Program Manager
APME	Associate Program Manager for Engineering
APML	Associate Program Manager for Logistics
APMM	Associate Program Manager for Maintenance
APMR	Associate Program Manager for Requirements
APMSE	Associate Program Manager for System Engineering
APMT	Associate Program Manager for Test
ARTCC	Air Route Traffic Control Center
ASO	FAA, Southern Region
ATC	Air Traffic Control
AWP	FAA, Western Pacific Region
CERAP	Center Radar Approach Control
COI	Critical Operational Issue
CONUS	Continental United States
CWSU	Central Weather Service Unit
D	Demonstration
dBz	Measure of Reflectivity
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
DT&E	Development Test and Evaluation
FAA	Federal Aviation Administration
GHz	Gigahertz
I	Inspection
ICD	Interface Control Document
IOT&E	Initial Operational Test and Evaluation
IMCS	Interim Monitor and Control Software
JSPO	Joint System Program Office
MCCP	Maintenance Control Center Processor
MDT	Maintenance Data Terminal
MMC	Maintenance Monitor Console
MPS	Maintenance Processor Subsystem
MTBF	Mean Time Between Failure
NAS	National Airspace System
NEXRAD	Next Generation Weather Radar
NOAA	National Oceanic and Atmospheric Administration
NTR	NEXRAD Technical Requirements
NWS	National Weather Service
ORD	Operational Readiness Demonstration
OSF	Operational Support Facility
OT&E	Operational Test and Evaluation
PAT&E	Production Acceptance Test and Evaluation
PM	Program Manager
PMO	Program Management Office

PUP	Principal User Processor
Q	Deferred
RDA	Radar Data Acquisition
RMMS	Remote Maintenance Monitoring System
RMS	Remote Monitoring Subsystem
RMSC	Remote Monitoring Subsystem Concentrator
RPG	Radar Product Generation
RPGOP	Radar Product Generation Operational Position
RTN	Return to Normal
SAT	Site Acceptance Testing
SFO	Sector Field Office
SOW	Statement of Work
T	Test
T&E	Test and Evaluation
TBD	To Be Determined
TEMP	Test and Evaluation Master Plan
TPRC	Test Policy Review Committee
TPWG	Test Plan Working Group
UCP	Unit Control Position
UTC	Universal Time Code
VRTM	Verification Requirements Test Matrix
WARP	Weather Acquisition and Radar Processor
X	Not Applicable

APPENDIX A

VERIFICATION REQUIREMENTS TRACEABILITY MATRIX (VRTM)

The TEMP VRTM presents requirements applicable to the NEXRAD redundant configuration and RMS testing.

The following provides VRTM column definitions:

1. REQ# - identification number is to reference requirements throughout the series of test documents produced by the FAA Technical Center;

2. VOL I Para. # - indicates NAS-SS-1000 volume I reference paragraph;

3. DESCRIPTION - describes the NAS-SS-1000 requirement;

4. VERIFICATION LEVELS:

"DT&E" -- Subsystem level (FACTORY/DT&E)
"OT&E (O)" -- OT&E Operational
"OT&E (I)" -- OT&E Integration
"OT&E (S)" -- OT&E Shakedown;

5. NAS STATUS is reflected with a "Q" in all blocks when requirements are deferred to system unavailability;

6. REMARKS -- Identifies lead-in paragraph or other relevant information.

NEXRAD NAS-SS-1000 REQUIREMENTS						
REQ#	VOL.III PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL			REMARKS
			OT&E(I)	OT&E(O)	OT&E(S)	
3001a	3.2.1.2.4.1.1.a	Identify the presence of Wind and Wind Shear	X	X	X	NOTE 1
3001b	3.2.1.2.4.1.1.b	Identify the presence of Turbulence	X	X	X	NOTE 1
3001c	3.2.1.2.4.1.1.c	Identify the presence of Mesocyclones	X	X	X	NOTE 1
3001d	3.2.1.2.4.1.1.d	Identify the presence of Precipitation	X	X	X	NOTE 1
3001e	3.2.1.2.4.1.1.e	Identify the presence of Hail	X	X	X	NOTE 1
3001f	3.2.1.2.4.1.1.f	Identify the presence of Tornadoes	X	X	X	NOTE 1
3002a	3.2.1.2.4.1.2.a	Measure wind velocities and portray estimates of turbulence intensity	X	X	X	NOTE 1
3002b	3.2.1.2.4.1.2.b	Measure wind velocities and portray estimates of precipitation intensity	X	X	X	NOTE 1
3003a	3.2.1.2.4.1.3.a	Analyze return radar signals to determine type of weather phenomena	X	X	X	NOTE 1
3003b	3.2.1.2.4.1.3.b	Analyze return radar signals to determine location of weather phenomena	X	X	X	NOTE 1
3003c	3.2.1.2.4.1.3.c	Analyze return radar signals to determine velocity of weather phenomena	X	X	X	NOTE 1
3003d	3.2.1.2.4.1.3.d	Analyze return radar signals to determine severity of weather phenomena	X	X	X	NOTE 1
3003e	3.2.1.2.4.1.3.e	Analyze return radar signals to determine forecast movement of weather phenomena	X	X	X	NOTE 1
3004a	3.2.1.2.4.1.4.a	Generate reflectivity maps providing echo-intensity data	X	X	X	NOTE 1
3004b	3.2.1.2.4.1.4.b	Generate maps providing mean radial velocity data	X	X	X	NOTE 1

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS						
REQ#	VOL.III PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL			REMARKS
			OT&E(I)	OT&E(O)	OT&E(S)	
3004c	3.2.1.2.4.1.4.c	Generate maps providing radial velocity spectrum width data	X	X	X	NOTE 1
3004d	3.2.1.2.4.1.4.d	Generate maps providing turbulence intensity data	X	X	X	NOTE 1
3004e	3.2.1.2.4.1.4.e	Generate maps providing storm structure and tracking information	X	X	X	NOTE 1
3004f	3.2.1.2.4.1.4.f	Generate data providing precipitation rate and accumulation products	X	X	X	NOTE 1
3004g	3.2.1.2.4.1.4.g	Generate maps providing combined shear data	X	X	X	NOTE 1
3004h	3.2.1.2.4.1.4.h	Generate maps and messages providing severe weather data	X	X	X	NOTE 1
3005a	3.2.1.2.4.1.5a	Disseminate weather products to the WARP routinely and upon request	Q	Q	X	NOTE 3
3005b	3.2.1.2.4.1.5b	Disseminate weather products to NOAA, DOD, and vendors	Q	Q	X	NOTE 3
3005c	3.2.1.2.4.1.5c	Disseminate maintenance data to the MPS	Q	Q	Q	NOTE 5
3006	3.2.1.2.4.1.6	Supply operational status	X	D	D	
3007a	3.2.1.2.4.1.7a	Accept operational control commands from the unit controller	X	D	D	
3007b	3.2.1.2.4.1.7b	Accept operational control commands from the RMS	Q	Q	Q	NOTE 5
3007c	3.2.1.2.4.1.7c	Process operational control commands from the unit controller	X	D	D	
3007d	3.2.1.2.4.1.7d	Process operational control commands from RMS	Q	Q	Q	NOTE 5
3008	3.2.1.2.4.1.8	Implement the RMS functional characteristics	Q	Q	Q	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS						
REQ#	VOL.III PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL			REMARKS
			OT&E(I)	OT&E(O)	OT&E(S)	
3009a	3.2.1.2.4.1.9a	Receive timing synchronized to universal coordinated time to support system recording	D	D	D	
3009b	3.2.1.2.4.1.9b	Receive timing synchronized to universal coordinated time to support system distribution of products	D	D	D	
3009c	3.2.1.2.4.1.9c	Maintain timing synchronized to universal coordinated time to support system recording	D	D	D	
3009d	3.2.1.2.4.1.9d	Receive and maintain timing synchronized to universal coordinated time to support system maintenance	D	D	D	
3009e	3.2.1.2.4.1.9e	Maintain timing synchronized to universal coordinated time to support system distribution of products	D	D	D	
3010	3.2.1.2.4.2.1	Detect weather phenomena between zero and 360° in azimuth, from -1 to 45° in elevation, and over an unambiguous range of 1 to 460 kilometers	X	T,A	X	NOTE 2
3011	3.2.1.2.4.2.2	Provide a minimum detection capability of at least 0 dB signal to noise ratio for a -8 dBz target at 50 km	X	T,A	X	NOTE 2
3012	3.2.1.2.4.2.3	Provide ground clutter suppression capability of 50dB for a mean radial velocity and spectrum width of 4 meters per second or greater	X	T,A	X	NOTE 2
3013a	3.2.1.2.4.2.4.a	Provide weather data continuously while operating under 14 elevation scans from 0 to 20° scan time of 5 minutes (storm mode)	X	T,A	I	
3013b	3.2.1.2.4.2.4.b	Provide weather data continuously while operating under 9 elevation scans from 0 to 20° in a volume scan time of 6 minutes (computer sizing mode)	X	T,A	I	
3013c	3.2.1.2.4.2.4.c	Provide weather data continuously while operating under 5 elevation scans from 0 to 5° in a volume scan time of 10 minutes (clear air mode)	X	T	I	
3014	3.2.1.2.4.2.5	Achieve a maximum throughput time of TBD minutes for any product	Q	Q	Q	

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NEXRAD NAS-SS-1000 REQUIREMENTS						
REQ#	VOL.III PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL			REMARKS
			OT&E(I)	OT&E(O)	OT&E(S)	
3015	3.2.1.2.4.2.6	Operates within the 2.7 gigahertz (GHz) to 3.0 GHz frequency bandwidth	X	I	I	
3016a	3.2.1.2.4.2.7a	Accept a maximum of 3 requests per second for weather products	X	T	T	
3016b	3.2.1.2.4.2.7b	Respond within 3.0 seconds after receipt of the request for weather products	X	T	T	
3017	3.2.1.2.4.2.8	Generate an alarm/alert within 5.0 seconds from detection of an alarm condition	X	T	T	
3018	3.2.1.2.4.2.9	Disseminate data to (maximum); 6 WARPs, 1MPS, 3 NWS/DOD, and 3 vendors	Q	Q	Q	NOTE 3
3019	3.2.1.2.4.2.10	Meets maintenance monitoring performance characteristics	Q	Q	Q	NOTE 5
3020a	3.2.2.1.4.2.11a	Categorize weather data into 6 levels of intensity: Level 1: 18=< dBz< 30 Level 2: 30=< dBz< 41 Level 3: 41=< dBz< 46 Level 4: 46=< dBz< 50 Level 5: 50=< dBz< 57 Level 6: dBz=> 57	X	T,A	X	NOTE 2
3020b	3.1.2.1.4.2.11b	Data shall not be displayed for dBz values less than 18	X	T,A	X	NOTE 2
3021	3.2.1.2.4.3-1.A	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 NEXRAD DOD	Q	Q	Q	Figure shown on NAS-SS-1000 Vol III Page 101, NOTE 3
3022b	3.2.1.2.4.3-1.B	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 MPS NEXRAD	Q	Q	Q	NOTE 3
3022c	3.2.1.2.4.3-1.C	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 NEXRAD MPS	Q	Q	Q	NOTE 3
3022d	3.2.1.2.4.3-1.D	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 NEXRAD NOAA	Q	Q	Q	NOTE 3

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS						
REQ#	VOL.III PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL			REMARKS
			OT&E(I)	OT&E(O)	OT&E(S)	
3022e	3.2.1.2.4.3-1.E	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 NEXRAD WARP	Q	Q	Q	NOTE 3
3022f	3.2.1.2.4.3-1.F	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 WARP NEXRAD	Q	Q	Q	NOTE 3
3022g	3.2.1.2.4.3-1.G	Interface functionally and physically as shown in figure 3.2.1.2.4.3-1 NEXRAD VENDOR	Q	Q	Q	NOTE 3
3023a	3.2.2.1-1a	NEXRAD (Inherent) Availability Requirement 0.99987616	X	T	T	NOTE 4
3023b	3.2.2.1-1b	NEXRAD MTBF Requirement 4037 hours	X	T	T	NOTE 4
3023c	3.2.2.1-1c	NEXRAD MTTR Requirement 0.5 hours	X	T	T	NOTE 4

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5001a	3.2.1.1.1.1.1a	An RMS shall collect subsystem key performance parameters in real time by use of hardware sensors, software sensors, or both from the subsystem of which it is an inherent part	D	X	D	X	NOTE 5
5001d	3.2.1.1.1.1.1d	The RMS shall collect self-test and monitoring information on the status, performance, and use of its own hardware and software for inclusion as part of the key performance or diagnostic performance parameters or both and make this data available to the MPS upon request	D	X	D	X	NOTE 5
5001e	3.2.1.1.1.1.1e	The RMS shall collect operating status and performance data that includes configuration and mode of operation from each subsystem within the subsystem of which it is inherent part	D	X	D	X	NOTE 5
5001f	3.2.1.1.1.1.1f	When directed by the MPS or MDT, the RMS shall initiate diagnostic routines, then collect the results for transfer to the location specified by the requestor	D	X	D	X	NOTE 5
5002a	3.2.1.1.1.1.3a	The RMS shall receive and recognize valid commands from either the MPS or the MDT including those to activate the functions given in 3.2.1.1.1.2.3	X	X	D	D	NOTE 5
5003a	3.2.1.1.1.1.4a	The RMS shall perform all collection functions including monitoring performance data, configuration data, and incoming requests at sampling rates which allow the system to detect changes commensurate with allocated RMS performance requirements	D	X	D	X	NOTE 5
5003b	3.2.1.1.1.1.4b	The RMS shall accept general messages and requests for data from either an MPS or an MDT	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5004a	3.2.1.1.1.2.1a	Compare the measured values of the performance parameters of the subsystem with up to two sets of stored thresholds-one set defining the ideal operating range representing the best possible conditions and one set defining the acceptable operating range representing the minimum permissible conditions-and determine within which range the parameters reside. Each range will be defined by up to two values to include an upper and a lower limit	D	X	D	X	NOTE 5
5004b	3.2.1.1.1.2.1b	Filter or average the performance parameters to prevent the declaration of alarms due to transient conditions	D	X	D	X	NOTE 5
5004c	3.2.1.1.1.2.1c	Generate an alarm when a key performance parameters value is outside the acceptable operating range	D	X	D	X	NOTE 5
5004d	3.2.1.1.1.2.1d	Generate an alert when a key performance value is outside the ideal operating range but inside the acceptable range	D	X	D	X	NOTE 5
5004e	3.2.1.1.1.2.1e	In the event of simultaneous multiple alarm conditions all alarms are stored in the RMS, and the RMS shall forward for transmission to the active interface all alarms on a first-in, first-out basis	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5004f	3.2.1.1.1.2.1f	Monitor and check each and every key performance parameter value for an alarm or an alert condition at least once during each general status cycle. A general status cycle consists of collecting and evaluating all data necessary to determine the health of the system and reporting the results (e.g. alarms, alerts, or sys okay) to the RMS/MPS interface or the RMS/MDT interface or both as required by the communications mode in effect. The time period in which the general status cycle must be completed shall be programmable from five seconds to 60 second in increments of 5 second or less	D	I	D	D	NOTE 5
5004g	3.2.1.1.1.2.1g	Monitor and check each and every key performance parameter value, detect any changes in value, and report the changed values to the RMS/MPS interface or the RMS/MDT interface or both as required by the communications mode in effect. The time period in which the general status cycle must be completed shall be programmable from 10 second to 2 minutes in increments of 10 second or less	D	I	D	D	NOTE 5
5004h	3.2.1.1.1.2.1h	Generate a general status message and a key performance parameter message at times which depend on the individual cycle time defined above	D	X	D	X	NOTE 5
5004i	3.2.1.1.1.2.1i	Generate a return to normal (RTN) message when a parameter causing an alarm or alert condition returns to its ideal operating range	D	X	D	X	NOTE 5
5004j	3.2.1.1.1.2.1j	Determine if a monitored data point, status, or condition has changed between the sampling of parameter values and generate a state change message if the state has changed	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	**VOL. V PARAGRAPH #**	**DESCRIPTION**	**VERIFICATION LEVEL**				**REMARKS**
			DT&E	**OT&E(O)**	**OT&E(I)**	**OT&E(S)**	
5004k	3.2.1.1.1.1.2.1k	Initiate a diagnostic test of a subsystem, which includes fault solation, in response to appropriate MPS or MDT command;bt	D	X	D	X	NOTE 5
5004l	3.2.1.1.1.1.2.1l	Initiate a fault recovery routine if an alarm or alert is generated.	D	X	D	X	NOTE 5
5006a	3.2.1.1.1.1.2.3a	Upon receipt of a valid command from either the MPS or the MDT, the RMS shall execute the control command	X	I	D	D	NOTE 5
5006b	3.2.1.1.1.1.2.3b	Upon receipt of a valid command from either an MDT or an MPS, the RMS shall change the current operating mode or configuration of a subsystem to the operating mode or configuration requested	X	I	D	D	NOTE 5
5006c	3.2.1.1.1.1.2.3c	Upon receipt of a valid command from either an MDT or an MPS, the RMS shall adjust the subsystem parameter as requested	X	I	D	D	NOTE 5
5006d	3.2.1.1.1.1.2.3d	Upon receipt of a valid command from either an MDT or an MPS, the RMS shall reset a subsystem or a part of a subsystem	X	I	D	D	NOTE 5
5006f	3.2.1.1.1.1.2.3f	Upon receipt of a valid command from either an MDT or an MPS, the RMS shall change the requested threshold values of the parameters being monitored.	X	I	D	D	NOTE 5
5006i	3.2.1.1.1.1.2.3i	Upon disconnect of an on-site MDT, the RMS shall automatically return to the remote communication mode with the MPS	X	I	D	D	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5007b	3.2.1.1.1.1.2.4b	Compare filtered key performance parameter values with the two sets of threshold values as part of each General Status Cycle to determine if an alarm or alert condition has occurred. One set of threshold values is for alarm condition determination while the other set of thresholds is for thresholds is for alert condition determination	D	X	D	X	NOTE 5
5007c	3.2.1.1.1.1.2.4c	Generate a report containing parameter values in response to a data request	D	X	D	X	NOTE 5
5007d	3.2.1.1.1.1.2.4d	Generate a report containing alarm and alert condition in response to a subsystem status request	D	X	D	X	NOTE 5
5007e	3.2.1.1.1.1.2.4e	Generate a maintenance data message containing information requested by either an MDT or an MPS	D	X	D	X	NOTE 5
5007f	3.2.1.1.1.1.2.4f	Provide a date in the form of month/day/year and universal time code (UTC) in the form of hours/minutes/seconds on each mesage and report	D	X	D	X	NOTE 5
5007h	3.2.1.1.1.1.2.4h	Generate the appropriate response to all commands	D	X	D	X	NOTE 5
5007i	3.2.1.1.1.1.2.4i	The RMS shall make available all command responses to the MPS or the MDT or both depending upon the nature of the request	D	X	D	X	NOTE 5
5007j	3.2.1.1.1.1.2.4j	The RMS shall prepare all messages for transmission in the appropriate protocol	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5007k	3.2.1.1.1.1.2.4k	The RMS shall convert sensor input information into values directly related to engineering units such that no scaling other than decimal placement shall be required of the receiving MPS or MDT	D	X	D	X	NOTE 5
5008a	3.2.1.1.1.1.3.1a	The RMS shall store all detected alarms and alerts until such alarm or alert condition no longer exists	D	X	D	X	NOTE 5
5008b	3.2.1.1.1.1.3.1b	The RMS shall be able to store key performance parameter values, diagnostic results, and operating mode data in temporary storage in preparation for transferring said information to the MPS	D	X	D	X	NOTE 5
5008d	3.2.1.1.1.1.3.1d	The RMS shall store two sets of threshold values (each set to include: an upper limit, a lower limit, or both) with one set for alarm thresholds and one set for alert thresholds in nonvolatile storage	D	X	D	X	NOTE 5
5008e	3.2.1.1.1.1.3.1e	The RMS shall store general programs needed for filtering data, formatting messages, encoding messages, converting data, and addressing messages in nonvolatile storage	D	X	D	X	NOTE 5
5008f	3.2.1.1.1.1.3.1f	The RMS shall store cycle time intervals for each of the cycles required by 3.2.1.1.1.1.2.1f	D	X	D	X	NOTE 5
5008g	3.2.1.1.1.1.3.1g	The RMS shall maintain records of the value of each monitored parameter, periodically updating each record	D	X	D	X	NOTE 5
5009a	3.2.1.1.1.1.3.3a	The RMS shall store information needed to decode control and adjustment commands for that RMS	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5009b	3.2.1.1.1.1.3.2b	The RMS shall store the initialization data needed to initialize the subsystem including all site dependent parameters in non volatile memory	D	X	D	X	NOTE 5
5010a	3.2.1.1.1.1.3.4a	The RMS shall store only filtered key performance parameter values obtained through monitoring	D	X	D	X	NOTE 5
5010b	3.2.1.1.1.1.3.4b	The RMS shall store alarm and alert threshold values, initialization tables, data required for interpreting addressing, and control and adjustment message function codes in non volatile storage	D	X	D	X	NOTE 5
5010c	3.2.1.1.1.1.3.4c	The RMS shall update stored performance parameter values and status data at least once during the general status cycle time interval, only keeping the most current equipment performance data	D	X	D	X	NOTE 5
5010d	3.2.1.1.1.1.3.4d	The RMS shall store, in nonvolatile memory, the data necessary for interpreting a message function code (the code within a message used by the RMS to determine the type of message)	D	X	D	X	NOTE 5
5010e	3.2.1.1.1.1.3.4e	The RMS shall retrieve maintenance data stored in the RMS and deliver it to the requesting unit upon receipt of a valid command	D	X	D	X	NOTE 5
5011a	3.2.1.1.1.1.4.1a	The RMS shall transfer collected subsystem performance data and status messages to the MDT and MPS upon request	D	X	D	D	NOTE 5
5011b	3.2.1.1.1.1.4.1b	The RMS shall transfer performance parameter data as a data report to the MPS upon at a specified interval defined as the key performance parameter cycle time interval	D	X	D	D	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5011c	3.2.1.1.1.1.4.1c	At a specified interval defined as the general status cycle time interval, the RMS shall transfer general status information consisting of a subsystem identifier, a date and time-stamp, and an indication that the subsystem is either 1) in an alarm condition (red status), 2) in an alert condition (yellow status), or 3) operating properly (green status)	D	X	D	D	NOTE 5
5011d	3.2.1.1.1.1.4.1d	The RMS shall transfer a state change message when such a change is determined and requires MPS notification. If appropriate, this message includes information indicating a specialist has logged on or off the RMS via an MDT	D	X	D	D	NOTE 5
5011e	3.2.1.1.1.1.4.1e	The RMS shall transfer the diagnostic performance parameter values to either the MDT or the MPS when requested. This request does not imply MPS control	D	X	D	D	NOTE 5
5011f	3.2.1.1.1.1.4.1f	If an alarm or an alert condition is detected, the RMS shall transfer the appropriate alarm or alert message containing measured parameter values to the MPS once	D	X	D	D	NOTE 5
5013a	3.2.1.1.1.1.4.3a	The RMS shall transfer a message indicating a state change whether the change is due to an automatic process or a command	D	X	D	D	NOTE 5
5013b	3.2.1.1.1.1.4.3b	Upon receipt of an invalid command, the RMS shall transfer a message indicating that the received command is invalid to the source of the input	D	X	D	D	NOTE 5
5014b	3.2.1.1.1.1.4.4b	The RMS shall transmit data in response to a valid request from the MPS and the MDT	D	X	D	D	NOTE 5
5015b	3.2.1.1.1.3b	No RMS function shall interfere with other functions of the RMS or the subsystem of which it is a part	X	D	D	D	NOTE 5

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NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5016a	3.2.1.1.3.1.1.1a	The MDT shall collect key performance parameter values, diagnostic performance parameter values, status messages, alarm messages, and alert messages from the RMS either directly or through the MPS	D	X	D	X	NOTE 5
5016b	3.2.1.1.3.1.1.1b	The MDT at an RMS location shall collect maintenance management information via the RMS for use by the maintenance specialist	D	X	D	X	NOTE 5
5016c	3.2.1.1.3.1.1.1c	The MDT shall collect the maintenance documents, including manuals and drawings, necessary for the technician to perform corrective and preventative maintenance on a NAS subsystem	D	X	D	X	NOTE 5
5016d	3.2.1.1.3.1.1.1d	The MDT shall collect data from the MPS via modem	D	X	D	X	NOTE 5
5017a	3.2.1.1.3.1.1.2a	The MDT shall collect subsystem security data including facility and data access security alarms from the RMS	D	X	D	X	NOTE 5
5017b	3.2.1.1.3.1.1.2b	The MDT shall collect passwords and user identification codes to pass through the appropriate unit for either MPS or RMS log on from the specialist	X	X	X	X	NOTE 5
5018	3.2.1.1.3.1.1.3	Control data collection. The MDT shall collect control commands listed in 3.2.1.1.3.1.2.3	D	X	D	X	NOTE 5
5019	3.2.1.1.3.1.1.4	Automated functions for data collection. The MDT shall collect user messages	D	X	D	X	NOTE 5
5020a	3.2.1.1.3.1.2.1a	The MDT shall format and display key performance parameter values, diagnostic performance parameter values, status messages, alarm messages, and alert messages from the RMS and the MPS	D	X	D	X	NOTE 5

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NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5020b	3.2.1.1.3.1.2.1b	The MDT shall display (visual and aural) indications of alarm and alerts to specialists	D	X	D	X	NOTE 5
5021a	3.2.1.1.3.1.2.2a	The MDT shall interact with the RMS or the MPS eventually to verify a specialist's authorization and permitted access to the RMMS by passing the user entered user identification code and password to the RMS	D	X	D	X	NOTE 5
5021b	3.2.1.1.3.1.2.2b	The MDT shall initiate a message commanding the RMS to inhibit all alarms generated by a facility or subsystem when in the local control mode	D	X	D	X	NOTE 5
5022	3.2.1.1.3.1.2.3	Control data processing. The MDT shall translate and encode the following type of requests from the user and prepare each for transfer to the RMS:	X	X	X	X	NOTE 5
5022a	3.2.1.1.3.1.2.3a	On-off control	X	D	X	X	NOTE 5
5022b	3.2.1.1.3.1.2.3b	Change mode	X	D	X	X	NOTE 5
5022c	3.2.1.1.3.1.2.3c	Change configuration	D	X	X	X	NOTE 5
5022d	3.2.1.1.3.1.2.3d	Adjust subsystem parameter	D	X	X	X	NOTE 5
5022e	3.2.1.1.3.1.2.3e	Disable and enable alarmor alert reports	D	X	X	X	NOTE 5
5022f	3.2.1.1.3.1.2.3f	Switch to local or dual mode	D	X	X	X	NOTE 5
5022g	3.2.1.1.3.1.2.3g	Maintenance data residing in the MPS	X	D	X	X	NOTE 5
5022h	3.2.1.1.3.1.2.3h	Maintenance documents residing in the MPS and the MDT	X	D	X	X	NOTE 5

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NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5023a	3.2.1.1.3.1.2.4a	The MDT shall accept alphanumeric data and free-form text, and syntax checks on selected entries for standard formats	D	X	D	X	NOTE 5
5023b	3.2.1.1.3.1.2.4b	The MDT shall format and display alphanumeric text and graphics	D	X	D	X	NOTE 5
5023c	3.2.1.1.3.1.2.4c	The MDT shall work with all RMS and MPS application software functions	D	X	D	X	NOTE 5
5024	3.2.1.1.3.1.3.1	Subsystem performance data storage. The MDT shall retain log entries for later transfer to the MPS in the event that communication between an MDT and an MPS is lost or nonexistent	D	X	D	X	NOTE 5
5025a	3.2.1.1.3.1.3.3a	The MDT shall retain all control actions taken by the specialist for later transfer to the MPS in the event that communication between an MDT and an MPS is lost or nonexistent	D	X	D	X	NOTE 5
5025b	3.2.1.1.3.1.3.3b	The MDT shall store the information necessary to perform syntax checks, encode commands, and prepare messages.	D	X	D	X	NOTE 5
5026a	3.2.1.1.3.1.3.4a	The MDT shall retain software applications which allow the specialist to initiate diagnostic routines, keep maintenance logs, and change parameters at the RMS	D	X	D	X	NOTE 5
5026b	3.2.1.1.3.1.3.4b	The prepared MDT display (screens) described in software applications shall look and act like those screens contained in the MPS or the Maintenance Control Center Processor-Maintenance Monitor Console (MCCP-MMC)	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5026c	3.2.1.1.3.1.3.4c	The MDT shall date and time-stamp all log entries in the format YYMMDD (YY - year, MM - month, and DD - day) if storing temporarily	D	X	D	X	NOTE 5
5026d	3.2.1.1.3.1.3.4d	The MDT shall temporarily store necessary selected sections of maintenace documentation for display to the technician	X	D	X	D	NOTE 5
5027	3.2.1.1.3.1.4.1	Subsystems performance data transfer. The MDT shall transfer log entries either from storage or directly when entered to the MPS for storage	D	X	D	X	NOTE 5
5028	3.2.1.1.3.1.4.2	The MDT shall transfer user passwords and identification codes to both the RMS and the MPS.	D	X	D	X	NOTE 5
5029	3.2.1.1.3.1.4.3	Control data transfer. The MDT shall transfer stored control actions to the MPS including:	X	X	X	X	NOTE 5
5029a	3.2.1.1.3.1.4.3a	Control actions taken	D	X	D	X	NOTE 5
5029b	3.2.1.1.3.1.4.3b	Parameter changes	D	X	D	X	NOTE 5
5029c	3.2.1.1.3.1.4.3c	Configuration changes	D	X	D	X	NOTE 5
5030	3.2.1.1.3.1.4.4	Automated functions for data transfer. When connected to either an MPS or an RMS, the MDT shall transfer electronic messages from the keyboard to the RMS for pass through to the MPS	X	X	X	X	LEAD-IN, NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD NAS-SS-1000 REQUIREMENTS							
REQ. #	VOL. V PARAGRAPH #	DESCRIPTION	VERIFICATION LEVEL				REMARKS
			DT&E	OT&E(O)	OT&E(I)	OT&E(S)	
5031a	3.2.1.1.3.2.1a	The MDT data storage capacity shall be based upon a maximum of 60 percent utilization under "normal" diagnostic circumstances. Normal circumstances means that communication with the MPS is available. Therefore, the storage of expected control actions, terminal messages, and log entires shall take up less than 60 percent of the available memory in the MDT	A,T	X	T	X	NOTE 5
5031b	3.2.1.1.3.2.2b	Communication. The MDT shall provide for the transfer of specialists' messages up to 4000 characters within an average time of 60 seconds and a maximum time of 120 seconds. This time is measured from the time the message is output by the MDT to the message receipt at the MPS	AT	X	T	X	NOTE 5
5032a	3.2.1.1.3.3a	The MDT shall support peripheral devices including a plotter and a printer	D	X	D	X	NOTE 5
5032b	3.2.1.1.3.3b	The MDT shall have the capability to interface with the commercial telephone network	D	X	D	X	NOTE 5
5032c	3.2.1.1.3.3c	The MDT shall contain a standard port for interface with the RMS	D	X	D	X	NOTE 5
5032d	3.2.1.1.3.3d	The MDT shall have the capability to physically interface with the MPS	D	X	D	X	NOTE 5

Verification Methods: T=Test D=Demonstration A=Analysis I=Inspection X=Not Applicable Q=Deferred

NEXRAD VRTM NOTES

NOTE 1: The three organizations which constitute the JSPO have performed extensive testing on the single channel NEXRADs. The capability of the NEXRAD system to detect these weather events is well documented. Testing, therefore, will focus on the redundant configuration features and their effects on performance of the system. For a detailed description of NEXRAD weather products see:

Next Generation Weather Radar Product
Description Document, R400-PD-202, NEXRAD
Joint System Program Office (JSPO), December, 1986

NOTE 2: Verification may require testing and/or analysis to existing single channel NEXRAD test data.

NOTE 3: Test and Evaluation shall be performed after the RMS has been implemented. This includes the evaluation of weather data to users such as DOD, NOAA and VENDORS. Interfaces must conform to technical specifications defined in Table 3.2.1.2.4.3-1 on Page 102. Vol. III, NAS-SS-1000.

NOTE 4: Inherent Availability, MTBF and MTTR figures shall be generated from actual on-site test data.

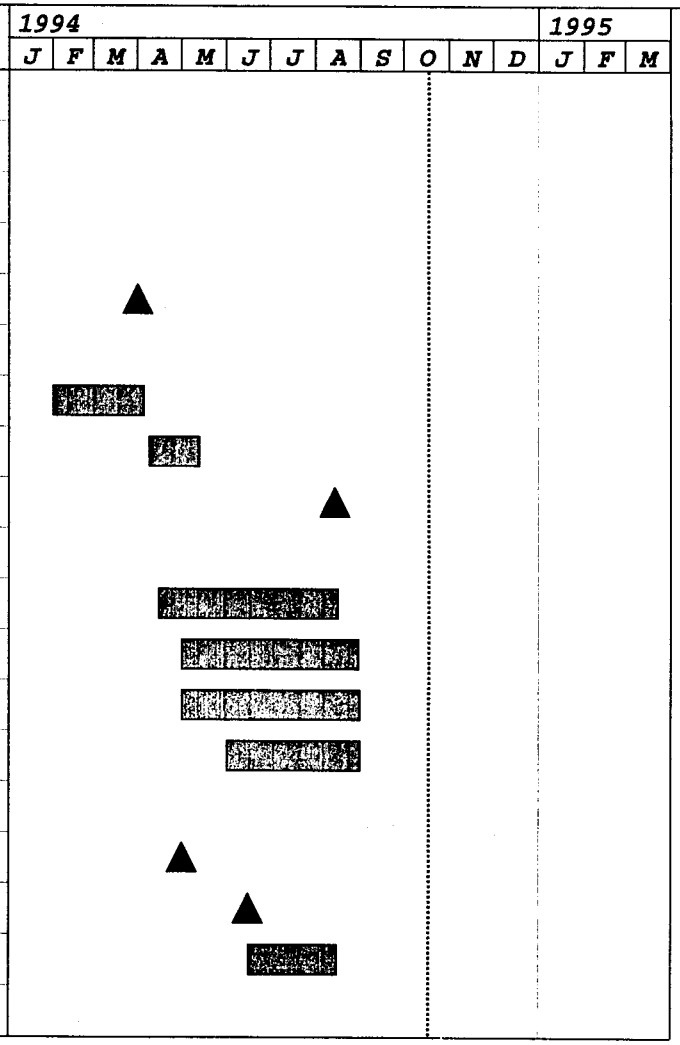
NOTE 5: RMS requirements will be tested after the RMS enhancement to the system has been developed.

APPENDIX B

OFFSHORE NEXRAD TEMP INTEGRATED SCHEDULE

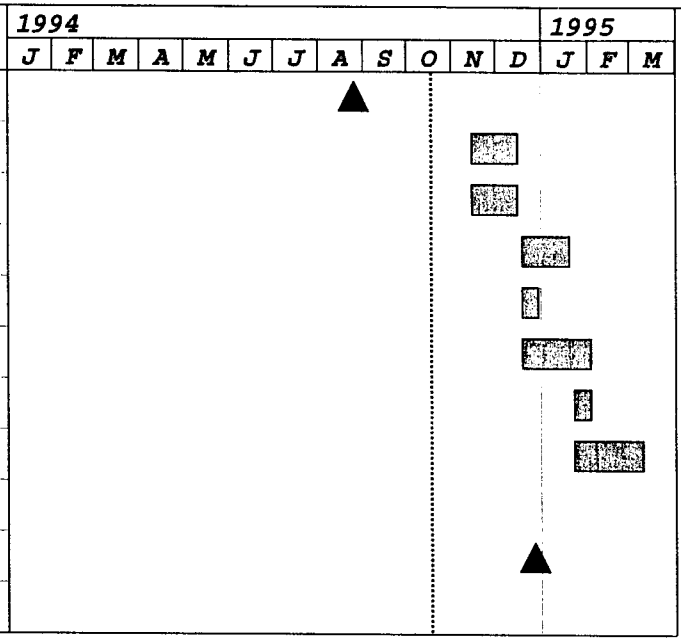
Offshore NEXRAD TEMP Integrated Schedule

Name	Start	Finish
Mission Need Statement		1/1/90
Specification (NTR 93)		11/1/91
Contract Award-Redundant Configuration		11/1/91
DT&E - Redundant Configuration	ongoing	
PCA		4/94
TEMP Completed	2/1/94	4/5/94
TEMP Comments Due Date	4/9/94	5/13/94
TEMP TPRC Approval		8/15/94
OT&E OPS/INT Plan	3/1/94	8/17/94
OT&E Shakedown Plan	5/1/94	8/31/94
OT&E OPS/INT Procedures	5/1/94	9/1/94
OT&E Shakedown Procedures	6/1/94	9/1/94
FCA		5/94
Equipment Delivery Date (Hawaii)	6/16/94	
Equipment Installation	6/16/94	8/16/94



Offshore NEXRAD TEMP Integrated Schedule

Name	Start	Finish
Test Readiness Review (TRR)		8/26/94
OT&E Integration - Redundant Configuration	11/15/94	12/16/94
OT&E Operational	11/15/94	12/16/94
OT&E Shakedown	12/19/94	1/20/95
OT&E OPS/INT Quick Look Report	12/19/94	12/30/94
OT&E OPS/INT Final Test Report	12/19/94	2/3/95
OT&E Shakedown Quick Look Report	1/23/95	2/3/95
OT&E Shakedown Final Report	1/23/95	3/10/95
DRR EXCOM		12/28/94



Offshore NEXRAD TEMP Integrated Schedule

Name	Start	Finish
RMS ICD	6/1/97	6/1/98
RMS IMCS Module	2/1/98	12/1/98
RMS OT&E OPS/INT Plan	7/1/97	3/1/98
RMS OT&E OPS/INT Procedures	12/1/97	9/1/98
RMS Confidence Testing	12/1/98	1/1/99
RMS OT&E OPS/INT Testing	1/1/99	2/1/99
RMS Shakedown	2/1/99	3/1/99
RMS OT&E/INT Quick Look Report	2/1/99	2/15/99
RMS OT&E OPS/INT Final Report	2/15/99	4/30/99
RMS Shakedown Quick Look Report	3/1/99	3/15/99
RMS Shakedown Final Report	3/15/99	5/30/99